

mite or deeper boring, but these were outside the valley. In some communities water had to be hauled miles by team or rail. But there was never a serious water shortage for human beings and a limited number of live stock in any community. The shortage of pasture and the certainty of high feed started cattle to market before wells failed, and the crop failure sent in the others about the same time that stock water for large bunches of cattle failed. Cattle died for water in a number of instances when the well or windmill failed to supply them as usual. But in every investigated case other water could have been procured in time had those in charge of the cattle visited them often enough to properly guard their trust.

The effect of the drought will not be as disastrous economically as previous ones, although it came as a climax to three successive years of poor crops, and more capital was involved in this than in any other. People seem to have confidence in the land as a source of wealth, and enough of them have resources they have created with money taken from the soil to keep the farms and businesses going until bountiful crops are made. There will be no more than normal emigration, and probably less of the movement from the farm to the city because there will be less opportunities in the cities until the farms are prosperous again.

DROUGHT OF THE SPRING AND SUMMER OF 1913 AT COLUMBIA, MO.

By GEORGE REEDER, Section Director.

At the close of April, 1913, the excess in precipitation for the first four months of the year was 2.19 inches, but by the close of the following month this excess had been cut down to a deficiency of 1.24 inches. It may be said that the drought in this vicinity began about the middle of April, as there was but one light shower after the 13th. The dry and sunshiny weather that prevailed during the latter part of April, however, was just the kind of weather needed, as there had been, owing to much moisture, little or no farm work done up to that time. The drought, though, steadily increased during May and June, and after becoming somewhat modified during July, culminated in one of the most disastrous droughts ever known here in the month of August and the first 10 days of September.

The showers in May were frequent, but they were too light to make the hay crop, which requires considerable moisture during this month. A short period of showers during the third week of June gave temporary relief, but the month closed with a total deficiency of 3.22 inches. The first half of July, on the other hand, gave frequent showers and a few good rains, the total for the month being 3.38 inches, which is only 0.27 inch below normal. About this time—the middle of July—the outlook had improved, and the community awaked to renewed optimism. The corn condition had improved, as well as pastures. But this pleasing outlook did not last long. On or about July 20 the drought set in again and a few days later, increasing heat; and from that time to the 10th of September, 53 days, only 0.93 inch of rain fell, 0.77 inch of this amount falling in August. The lack of moisture was, of course, intensified by excessive sunshine and high temperature.

The most harmful effects of the drought were that the hay and potato crops, as well as gardens and pastures,

were reduced to nearly total failures, ponds dried up, corn was seriously damaged, and fall farm work was delayed.

In regard to a more concise opinion of the harmful effects of the drought, Prof. F. B. Mumford, director of the local experiment station, has kindly furnished the following information:

The drought has been severe on upland soils of this county. The season has been very favorable for the maximum production of corn on the bottom lands in Boone County. It is difficult to estimate the actual cash damage to staple crops, but I am of the opinion that the yields on the uplands in this county will not be larger than one-third of a crop secured in a good corn year. The hay crop was very light, and the pastures have not been able to carry more than one-third or one-half as many animals during the present season as carried in an ordinary season. The general results of the very dry season and unusual hot weather have dried up the water holes upon which farmers have depended for stock water, and this, with the scarcity of feed, has compelled a large number of farmers to dispose of their stock cattle, sheep, and hogs, and also, what is still more serious, to dispose of breeding animals to a considerable extent. How great this loss is, it is difficult to estimate.

It is reported that the apple crop is seriously affected, and even the forest trees have dropped more than half their leaves, the ground being covered with them as much as one observes in late October.

THE HEAT AND DROUGHT OF 1913 AT HANNIBAL, MO.

By B. L. WALDRON, Local Forecaster.

The heat wave of 1913 was remarkable for its long duration and the very short periods of relief. It began on May 28 and from that time to September 7, a period of 103 days, there were but 21 days with the temperature below normal. There were 69 days with maximum temperature of 90° or above, and 9 days with a maximum of 100° or over, the highest being 103° on August 7. The average daily excess above the normal was 4.8°. The record of high temperatures by months was equaled in May and September and exceeded in August.

While the mean for the three summer months was not as high as in 1901, yet the mean for July and August combined was higher than during any previous year.

The relative humidity was much below normal, and it is believed there was less suffering from the heat than often occurs with lower temperatures, reports indicating that there were no deaths from heat and only one or two prostrations from that cause.

The summer of 1913 was the driest since the local office was established in 1892. The drought began April 10 and from that time to September 9 there were only two rains that exceeded one-half inch, and but one that exceeded 1 inch. During these 5 months there was a total rainfall of only 5.19 inches, and the accumulated deficiency for that period amounted to 13.87 inches. The drought of 1901 began April 7 and for the 5 months ending September 6 there was a total rainfall of 7.41 inches.

From information at hand it appears that crops are better this year than in 1901. This is probably accounted for, in part at least, by the fact that when the present drought commenced the ground was well saturated with water. Cultivation began as soon as the ground was dry enough and continued until the size of the growing crops prevented further working. In 1901 the winter had been excessively dry and the spring rains were only moderate.

The wheat crop was good this year, but most other crops were seriously damaged. Hay, oats, and gardens were nearly failures and it is reported that corn will hardly make one-half the usual crop.

The Mississippi River maintained a stage above the average for dry seasons, but the smaller rivers were very low. Palmyra, Mo., had much trouble in obtaining sufficient water and it is reported that other small towns in this vicinity had a similar experience.

NOTES ON THE HEAT AND DROUGHT DURING THE SUMMER OF 1913 AT KANSAS CITY, MO.

By P. CONNOR, Local Forecaster.

The drought of 1913 was not being felt in this section until about the close of June. The rainfall for July, while quite good, was still insufficient for grain crops, fruits, and vegetables, owing to the excessively high temperatures, the unusually clear sky, and dry atmosphere. The showers were chiefly north of the Missouri River. A short distance west and south vegetation at the close of the month was in a deplorable condition. Prospects were never brighter for good crops in all lines than at the beginning of summer, but each succeeding week saw them diminish most discouragingly. However, crops of all kinds were in better condition this year at the close of July than in either 1901 or 1911.

August proved to be the blighting month and came with exceptional severity while everything was in urgent need of relief. It had next to the highest mean temperature of any month on the records, the lowest humidity, the least cloudiness, and the greatest amount of sunshine, and not one cloudy day. The merciless sunshine seemed to sap the vitality of plants even well watered. It appeared as if the tremendous heat overcame the capillary action and the respiratory powers of vegetation. All late crops were failures. Corn that promised fairly well at the beginning of the month was damaged 75 to 90 per cent, and dairy and stock cattle were being fed as in winter. Some localities report that water was never so scarce, 50 to 75 per cent of streams and stock ponds being dry, and farmers in many localities had to haul water 5 to 9 miles for their stock. This was the most serious problem that confronted them and was the cause of sending a record-breaking number of cattle to the local market. Pastures were absolutely gone, and the quantity of milk was reduced 25 to 50 per cent. Winter apples are a total failure, and the peach crop was about 50 per cent short.

The drought this year was about a month later than in 1901 and nearly two months later than in 1911, in consequence of which all early crops were saved.

In contrast with 1901, the health of the community was remarkably good. Few deaths were ascribed to the heat, and the general good health of the community had been publicly commented upon. While remarkably high night temperatures prevailed, the very dry atmosphere, coupled with gentle breezes, gave quite good rest at night, even indoors, although most people slept out of doors.

Quotations on the necessities of life would hardly be an exact index to the conditions in this section, as most of those products have been shipped in from States not so remote that the cost of transportation would add much to the purchase price. It is understood that merchants are placing smaller orders, in view of an inevitably re-

duced volume of business during the coming year. One large establishment is reported to have turned in only 65 per cent of the usual orders.

How the drought is viewed by other communities close by appears in the following notes:

Harrisonville, Mo., more severe than in 1901 and 1911.

Olathe, Kans., more severe than in 1901 and 1911.

Fort Scott, Kans., more severe than in 1901 and 1911.

Maryville, Mo., more severe than in 1901; about the same as 1911 for corn and other late crops.

Lexington, Mo., not so bad as 1901; more severe than 1911.

Dairy farm southwest of city, more severe than 1901 and 1911.

HEAT AND DROUGHT AT ST. JOSEPH, MO., DURING THE SUMMER OF 1913.

By W. S. BELDEN, Local Forecaster.

The deficiency in rainfall in this vicinity began about May 20 and continues at the present time, September 9, the actual rainfall for this period being 3.44 inches, or about 18 per cent of the normal amount. From July 8 to September 9, inclusive, there was only 0.64 inch of rainfall at this station, and during this time the temperature reached 90° or higher on 53 days and 100° or higher on 26 days, the highest reading being 105°. During the drought the prevailing wind direction was south, and the average velocity was somewhat above the normal. The relative humidity was decidedly deficient, especially in August, when at several 8 p. m. observations during the latter part of the month it was found to be as low as 20 per cent. From July 11 to September 9, inclusive, there was only one cloudy day.

The wheat, oats, and early cuttings of hay and other early crops were not affected by the drought, but the corn crop in this section will not exceed one-third of an average crop. Apples dropped badly and as result of the hot and dry weather there will be about one-tenth of a normal yield, the Jonathan and Grimes Golden yielding better than other varieties. Pastures have been barren of feed for weeks and the shipment of unfattened stock to market has been heavy. During the latter part of August one local railroad handled five times as many cars of stock as are usually handled at that time of year. The ground has become too dry and hard to plow with any degree of satisfaction, and as a result there has been practically no seeding of grass, especially alfalfa, and wheat seeding will be much delayed with diminished acreage.

In many places the dust in wagon roads is 3 inches deep. Hundreds of fires have been started by sparks from railway locomotives falling upon dry and parched vegetation, and the railroads are receiving many claims for damages resulting therefrom. Creeks and wells have failed to such an extent as to necessitate the shipment of water in some cases. Since August 3 five tank-car loads of water have been shipped daily from this place to Union Star, Mo., 25 miles distant. The failure of water supplies has also necessitated the hauling of much water by the railroads for their own use. A local contractor, who is building a concrete bridge over a creek never before known to go dry, is hauling water in barrels several miles in order to proceed with the work. At Maryville, Mo., the opening of schools has been delayed on account of the shortage of water, and the death rate in St. Joseph for August was considerably above the average, attributed to the adverse weather conditions.